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X-ray absorption spectroscopy of transition-metal aluminides

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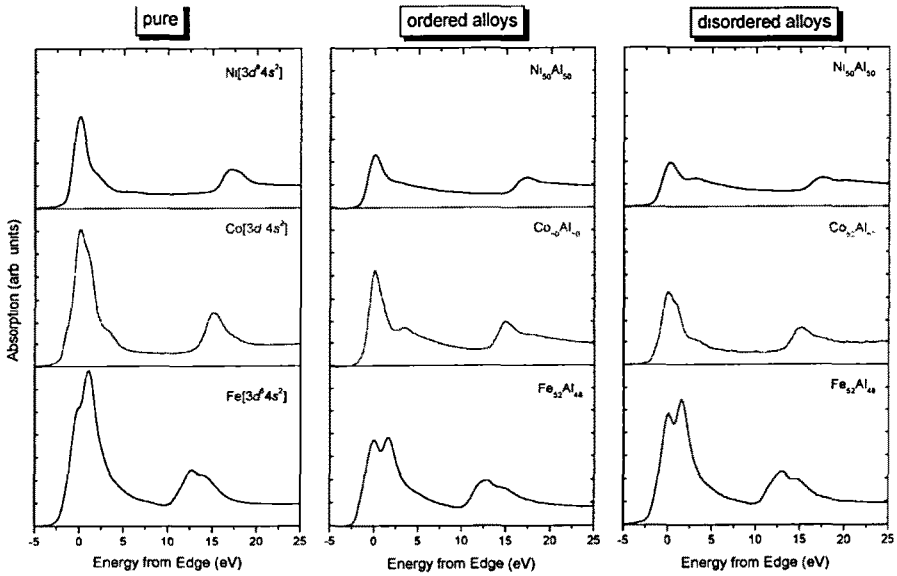
Transition-metal(TM) aluminides have the same CsCl(B2) crystallographic structure, but exhibit different mechanical and magnetic properties. In the electronic structure which can be related to the variations of macroscopic mechanical or magnetic properties, these aluminides are adequate to study systematic variations because of the series of neighboring element TM (Fe, Co, and Ni).

X-ray absorption near-edge structure(XANES) can provide complementary information concerning unoccupied states just above the Fermi level. This work investigates the TM *d*-Al *p* hybridization effects in the TM aluminides using the TM(Fe, Co, and Ni) $L_{3,2}$ and *K* edge and Al *K* x-ray absorption near edge structure(XANES) measurements. The XANES measurements were performed at SPEEM beam line in the Pohang Accelerator Laboratory. The spectra were collected in the total electron yield mode. We find that the intensity of near-edge features[Fig. 1] at the Fe, Co, Ni L_3 edge in these aluminides decreased with respect to that of pure elements, which implies a reduction of the number of unoccupied TM 3*d* states and an enhancement of the TM 3*d* state filling in these aluminides.



[Fig. 2] Normalized Fe, Co, and Ni $L_{3,2}$ -edge x-ray absorption spectra.